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November 4, 2010

Jill Gable
U.S. EPA, Region 10
1200 Sixth Ave.
Seattle, WA 98101

Re: Ecology Comments on draft QAPP for ARM System

Dear Jill:

Thank you for the opportunity to comment on the draft Quality Assurance Project Plan: Protecting Puget Sound Watersheds from Agricultural Pollution Using a Progressive Manure Application Risk Management (ARM) System.

Ecology expressed serious concerns in our June 9, 2010 letter from Josh Baldi regarding whether the proposed ARM system study can adequately protect groundwater, surface water, and shellfish beds in Whatcom County. Most of these concerns are not addressed in the draft Quality Assurance Project Plan (QAPP). Concerns in our letter that were not addressed include:

- NRCS standard for winter manure application (Technical Note 14) including prohibition of manure application when fall soil nitrate exceeds 60 lb/acre (15 mg/kg).
- Risk factors in the assessment were not adequately protective of receiving waters (permeable soils rated "low risk").
- Ground Water Quality Standards (Chapter 173-200 WAC) for nutrient application: agronomic rate/non-growing season storage requirement.
- Avoiding sites where groundwater nitrate-N exceeds 5 mg/L and fall soil nitrate exceeds 15 mg/kg.
- Adequate and reliable groundwater monitoring.
- Scaling back the project so that effects on the environment could be analyzed before expanding beyond 4 farms the first two years and another 4 farms the second two years.
- Including Ecology and other affected stakeholders on implementing the ARM system in nutrient management plans beyond 8 test sites.

These basic concerns need to be addressed in order to determine whether the ARM System is protective enough to test, even on a limited scale. We recognize that you are promoting this effort because there are concerns related to fall manure application and this is one potential solution. We think this is a risky option, and we are also not proponents of fall application of manure. A more sustainable solution for managing manure in Whatcom County is needed, and this project as designed causes us great concern.

Ecology would like to meet with you to discuss our concerns and how to address them so that the study can move forward while being protective of the environment.

We have additional concerns and suggestions about the draft QAPP related to:

- Specifics of the ARM System.
- Agronomic application rates and nutrient utilization.
- Scientific basis for evaluating effectiveness and effects of the ARM.
- Degraded condition of surface and groundwater in target areas.
- Ecology Quality Assurance Project Officer comments.

These concerns are described below.

- **Specifics of the ARM System**

  The QAPP includes almost no details of the ARM System. The background, references, 15+ soil and field characteristics, methods and criteria for rating risk, and the track record of the system need to be disclosed in the QAPP.

  One detail of the ARM System mentioned in the QAPP is that no manure would be applied if the weather forecast includes "significant" precipitation for 3 days. This is not adequately protective of surface water for at least three reasons:

  - Weather forecasts are unreliable.
  - Fecal coliform bacteria can run off pasture land even 3 days (and probably many more days) after manure application in the winter. A 2.2-inch rainfall event 3 days after a light January manure application caused direct runoff to a nearby buffer strip at a southwest Washington pasture (Nennich, et al, 2005). Fecal coliform bacteria concentrations that had increased from 16 CFU/100 g wet soil before manure application to 100,000 CFU/100 g wet soil afterward did not return to background concentrations for 42 days.
  - How "significant" precipitation will be determined?

  The logic model and risk factors must adequately protect state waters.

- **Agronomic application rate and nutrient utilization**

  The foundation of nutrient management plans is nutrient utilization. The QAPP for the ARM System needs to document and cite references to justify nutrient needs of winter crops, application rates, and expected yield of winter crops.

  The QAPP should include the following components of a nutrient utilization analysis that will be conducted for test fields. The QAPP should also include the method by which nutrient utilization and manure application are determined for each winter crop:

  - Soil nitrate available for winter crop.
  - Soil organic nitrogen available, expected winter mineralization rate of soil organic nitrogen, and expected resulting nitrogen available for winter plant uptake from soil organic nitrogen.
  - Amount of nitrogen needed to meet the winter crop nutrient needs and the source of nutrients.
  - Manure organic nitrogen concentration, expected winter mineralization rate(s) of manure organic nitrogen, and amount of manure organic nitrogen available for plant uptake.

- **Scientific basis for evaluating effectiveness and effects of the ARM**
  - The draft QAPP Problem Background (5.2, p. 11) portends that the reason for surface water and groundwater contamination problems in the Nooksack Watershed is the current manure application starting date (T-Sum 200 or February 15, whichever is sooner) and that current guidelines do not promote better application practices. However, the concept of applying nutrients under appropriate conditions and in appropriate amounts for crop uptake is already a hallmark of dairy nutrient management plans and the NRCS standards on which they are based.

    Current nutrient management protocols require that nutrients are applied to meet crop needs while minimizing the movement of nutrients and other pollutants to surface and groundwater. Nutrient management plans must address the loss of nutrients and other pollutants to erosion, runoff, irrigation, drainage and leaching. Nutrients must also be applied at times that minimize the loss of nutrients and other pollutants from all potential pathways.

    In fact, long-term fecal coliform monitoring in tributaries to the Nooksack River, where a TMDL was implemented and regulatory enforcement conducted, showed fecal coliform load reductions and improving conditions until 2003 (Appendix A). However, decreasing regulatory oversight in recent years corresponds with steadily increasing fecal coliform concentration and water quality standard

violations in 7 of 8 these streams. While we agree that a system for "farmers to assess their unique field conditions and practices" will help improve implementation of nutrient management plans, we do not agree that dropping the winter application starting date will improve nutrient utilization or water quality.

- The draft QAPP does not define how success of the ARM System will be scientifically evaluated. Several of the deliverables include "assess and validate" the ARM System. The plan should explain how the data collected will be analyzed to evaluate impacts on the groundwater, surface water, and shellfish.

  The draft QAPP refers to our previous suggestion to design the analyses using paired tests of either before/after treatment or test/control sites: "When applicable, paired test and control fields will be used to measure the difference between application strategies and practices." What conditions will be "applicable," and what is the alternative scientific strategy for testing effectiveness and effects on the groundwater, surface water, and shellfish if paired tests are not applicable?

- Groundwater monitoring only in existing monitoring wells is inadequate to evaluate the effects of the ARM System. To our knowledge there is one field with 6 shallow monitoring wells and perhaps 2-3 others in the area. There is no surrogate for groundwater monitoring. Each test field should have a monitoring network as described in our previous letter.

- Soil water is not a surrogate for groundwater. This is a notoriously difficult media to monitor (Steenhuis, et al, 1995). Preferential flow paths are often the main flow route for unsaturated flow. Spatial and temporal heterogeneity are huge. Water usually flows around both passive and suction samplers regardless of how carefully they are installed. To get a 95% confidence interval, as proposed in the QAPP, Holder (1991) needed 2-31 samplers in an 8 ft x 12 ft test area.

  Soil water data are not easily interpreted, because most flux models of do not incorporate preferential flow (Wilson and Dorrance, 1995). We recommend eliminating soil water monitoring.

- Roll-out of the ARM System is unrealistically fast. Monitoring at the 20 farms added in years 3 and 4 sound limited if at all. We previously recommended scaling back to 4 farms/2 years for a total of 8 farms in 4 years instead of a total of 35 farms in 4 years. Partner agencies, including Ecology, need to be involved in evaluating initial results to determine whether the system is protective of water quality.

- Selection of test farms (Section 10.1) does not mention "high" and "low" risk areas as defined in Phase 1. Low risk areas should be the target, since this is an experimental method, and the receiving waters (both surface and groundwater) are already degraded. As outlined in our previous letter, the risk assessment needs to include permeable soils where nitrate leaching to groundwater in the winter is likely.

- Fecal coliform sampling should emphasize precipitation events and occur at each study site.

- Training and oversight are needed to ensure that producers conduct field assessments for the risk worksheets according to the standard procedures developed for the risk assessment.

- Detailed standard operation procedures are needed for each media to be sampled (manure, soil, groundwater, surface water, forage, air). See U.S. Geological Survey, (1995) protocols for groundwater sampling.

- Analytical methods need to be referenced.

- Section 10.3.4. Sullivan and Cogger (2003) recommend 15-30 soil cores per field to characterize soil nitrate. The study should follow this protocol. A specific time frame is needed for soil samples collection prior to manure application. For fecal coliform samples, the soil sampler should be sterilized between sites (include in soil sampling SOP).

- Section 10.3.5. Apparently manure samples will only be collected years 1 and 2 of the study. Manure samples need to be collected at each application event in order to estimate nitrogen application rates. Accurate estimates of manure volume are also needed for nitrogen loading estimates for each application of manure.

- Composite samples every 10,000 gallons is too infrequent. During the growing season, the volume applied at the H St. Rd. site has typically been 3,000-10,000 gallons on 22 acres. A much lighter application would occur during the winter and at least 2-3 manure samples needed per field.

- Section 10.3.6. Crop/forage--Crop yield is reported to occur 4-6 times/year for grass fields. This should occur at all test fields.

❖ **Degraded condition of surface and groundwater in target areas**

- At least 4 of the 7 test farm locations for years 1 and 2 are located in areas where groundwater nitrate-N concentrations have been over 15 mg/L (drinking water standard is 10 mg/L) as shown in Ecology's previous comments. Public water supply wells that have been taken off-line due to nitrate exceedences are also in or near these target areas. We previously recommended that study sites be chosen where groundwater nitrate is less than 5 mg/L.

- Most long-term sampling locations in the Nooksack Watershed do not currently meet the fecal coliform water quality standard. See Appendix A for recent water fecal coliform loading increase information for the TMDL area.

- A fecal coliform TMDL is currently under development in the Drayton Harbor Watershed. The harbor is most sensitive to fecal contamination from November to February (Mathieu and Sargeant, 2008). Fecal coliform concentrations in the South Fork Dakota Creek Drainage, where one of the initial test farms is located, are already well above water quality standards (Appendix B). Drayton Harbor is a shellfish growing area that is particularly sensitive to fecal pollution due to its shallow, enclosed nature and variety of non-point sources. Winter manure application increases the risk of surface water contamination during large storm events and using this watershed in the experimental phase runs the risk of further degradation of a sensitive, impaired shellfish area.

❖ **Ecology Quality Assurance Project Officer comments**

Bill Kammin, Ecology QA Officer:

General comment – This QAPP has serious flaws, and if it was presented to me as an internal Ecology document, I would not be able to approve it. The QAPP would be returned to the author for significant changes, and work would be stopped on the project until those changes were made. Following are areas requiring revision:

1. There is no references section. For a 50+ page document, this is unacceptable. Provide references for all facts, figures, and scientific statements not of common knowledge. A document of this length would typically have 10-20 references.
2. SOPs. Field SOPs, or at a minimum, references to those SOPs, are needed in the document for all field sampling and field analytical activities.
3. Any field activities undertaken by landowners in support of this project must be strictly defined (by SOP), to promote uniformity. This would include depth-to-water measurements.

4. Accreditation – It does not appear that the agricultural methods called out are accredited by Ecology.
5. DQI's are not quantitative. Each method should have its own experimentally determined or literature derived, set of DQI's.
6. Lack of objective tone in document – The document, in several places, takes a strong advocacy position, which compromises the scientific basis for the study.
7. QA Officer for the project must have relevant training.

We hope these comments are helpful and look forward to meeting with you to discuss them.

Sincerely,

Richard Grout
Manager
Bellingham Field Office

Will Kendra
Section Manager
Environmental Assessment Program

Enclosures (3)

cc: Josh Baldi, Special Assistant to the Director
Rob Duff, Manager, Environmental Assessment Program
Melissa Gildersleeve, Section Manager, Water Quality Program
Ron Cummings, Water Quality Program
Barb Carey, Environmental Assessment Program
Steve Hood, Bellingham Field Office

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Appendix A. Nooksack River TMDL fecal coliform information.

Most long-term monitoring locations in the Nooksack watershed show a steady increase in fecal coliform loading since 2003.

- Most locations are not currently meeting standards.
- From 2003 to present, most monitoring locations show a steady increase of fecal coliform (7 of 8 locations).
- Prior to 2003, fecal coliform ***load reductions*** were greater than TMDL target reductions.
- The following Nooksack River tributaries have the following water quality trends, *2003 to Present:*
  - Anderson Creek – 9 cfu/100 ml **per year increase**
  - Fishtrap Creek – 20 cfu/100 ml **per year increase**
  - Bertrand near Mouth – 9 cfu/100 ml **per year increase**
  - Deer Creek – 3 cfu/100 ml **per year increase**
  - Kamm Creek – 9 cfu/100 ml **per year increase**
  - Scott Ditch – 22 cfu/100 ml **per year increase**
  - Nooksack River at Marine Drive - 1 cfu/100 ml **per year increase**

Appendix B. Drayton Harbor TMDL fecal coliform information (Mathieu, 2010)

Winter (November to February) fecal coliform concentrations in the South Fork Dakota Creek drainage have a relatively low baseline level (geometric mean), but very high FC concentrations during infrequent events (90th percentile) (Table 1).

Both geometric mean and 90th percentiles need to be reduced to meet the TMDL load allocation. Figure 1 contains FC sampling results for each sample date.

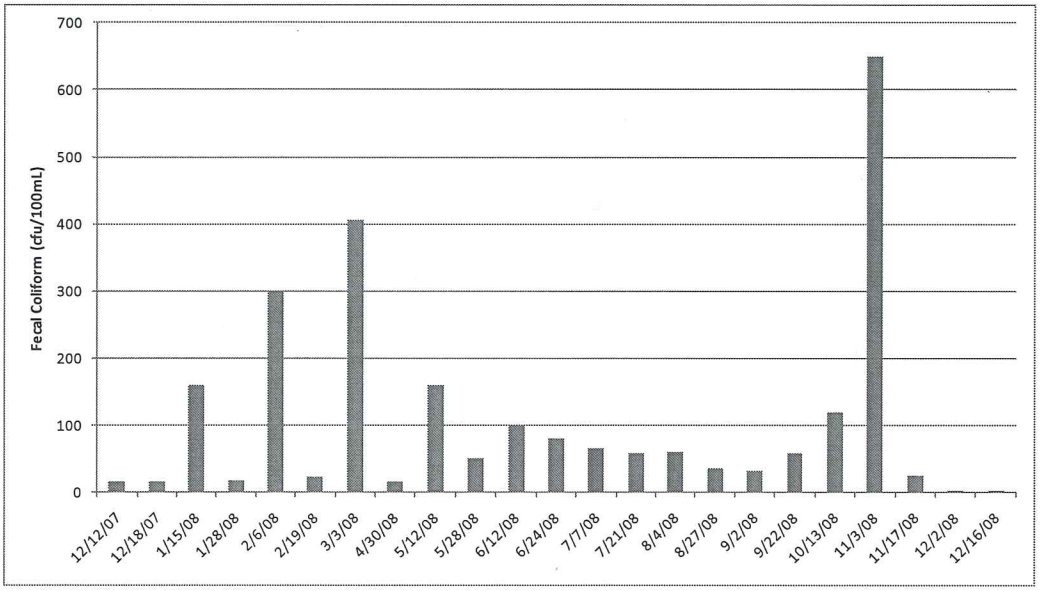

Figure 1. Fecal coliform concentrations for the South Fork Dakota Creek near the mouth from December 2007 to December 2008.

Table 1. Fecal coliform statistics, load allocations, and necessary percent reduction for the South Fork Dakota Creek near the mouth.

Station ID	Site Description	Observed FC (cfu /100mL)		FC Reduction	FC Load Allocation (cfu /100mL)	
		Geo-mean	90th %tile		Geo-mean	90th %tile
Wet Season (November to March)						
1-SF-Dak-0.2	SF Dakota Creek at Custer School Rd	42	480	88%	21	59

FC= Fecal Coliform